What's beyond 241?

What did you learn?

Course Questions

- What is an operating system?
- What is it for?
- How do I use it?
- What is concurrency?
- What is system programming?

Understand the Basics

- Use UNIX system calls correctly from within C programs

Make the OS do tasks

- Create and manage processes and threads in UNIX
- Control OS scheduling policy parameters
- Exploit OS semaphores and mutexes
- Take advantage of OS signals and signal handlers
- Understand tricky problems with all these aspects of concurrent programming: deadlocks, race conditions, lost signals, ...

Manage machine resources

- Manage memory
- Manage files and I/O on UNIX

Communicate between processes

- ...on a single machine
  - pipes
  - FIFOs
  - memory mapping
- ...across the Internet
  - Use communication protocols (TCP/IP) and interfaces (Sockets)
  - Write distributed multi-threaded apps that talk across a network

Topics

- Introduction to OS's
- Introduction to C
- C No Evil
- Operating Systems Orientation
- System Calls
- Processes
- Threads
- pThreads Tutorial
- Threads Systems Concepts
- Scheduling
- Synchronization
- Semaphores, Mutexes, Condition variables
- Classic Synchronization Problems
- Deadlocks
- Interprocess communication: Pipes, FIFOs, memory mapping
- Signals
- Intro to Networking
- Networked Applications
- Intro to Memory
- Allocation & VM
- Page Replacement
- Memory/Page Allocation
- IO System
- Disks & disk scheduling
- File systems
- File systems: user's view

What to take next

Some options …

- 411 Database Systems
- 414 Multimedia Systems
- 418, 419 Computer Graphics
- 420 Parallel Programming
- 421 Prog. Languages & Compilers
- 423 Operating Systems Design
- 424 Real-Time Systems
- 425 Distributed Systems
- 426 Compiler Construction
- 427 Software Engineering, I
- 431 Embedded Systems
- 433 Computer System Organization
- 438 Communication Networks
- 439 Wireless Network
- 461 Computer Security I
- 463 Computer Security II

… and a lot more

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… and a lot more

CS 423: Operating Systems Design

- Topics
  - Include threads and synchronization, virtualization and virtual machine monitors, file systems and I/O, distributed systems, and security
- Professor: Roy Campbell (Fall 2010)
- Follow up classes
  - cs 414, cs 523

CS 438: Communication Networks for Computers

- Topics
  - Networked communication from local area networks up to the global Internet
  - Ethernet, IP, TCP, routing, congestion control, security, ...
  - Performance measurement and basic notions of probability and statistics for performance prediction
- Professor: Steven Lumetta (Fall 2010), Brighten Godfrey (Spring 2011)
- Follow up classes
  - cs 429, ece 425, cs 538

CS 425: Distributed Systems

- Topics
  - Design, implementation, and management of distributed systems
  - Synchronization, election, distributed agreement, inter-process communication and coordination, replicated data management, distributed objects, security, and directory and discovery services.
  - Discussed in the context of real-life and deployed systems (distributed file systems, databases, P2P systems, Grid)
- Professor: Indranil Gupta (Fall 2010)
- Follow up classes
  - cs 525

CS 498 LA: Undergrad Research Lab

- Approach
  - Apprenticeship-style, hands-on laboratory
  - Team-based (requires consent of instructor) ~14 students
  - Ideal for CS Juniors who will be applying to graduate schools
- Goal: Teach students learn to
  - Pose testable research questions
  - Write competitive grant proposals
  - Create novel solutions using software and/or hardware
  - Draw valid scientific conclusions
  - Present and publish results as a scientific publication
- More information:
  - Email angrave@illinois.edu, bnsmith3@illinois.edu
  - Project ideas: https://agora.cs.illinois.edu/display/url/Project+Proposals
  - https://agora.cs.illinois.edu/display/cs498la/Home

Research Part 1: Robin

Research Part 2: Brighten